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भाग 1 सुरक्षा अपेक्षाएँ

Indian Standard

CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS — SPECIFICATION

PART 1 SAFETY REQUIREMENTS

UDC 621·397·743 : 614·8

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

April 1995

Price Group 7

Radio Communications Sectional Committee, LTD 20

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Radio Communications Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

This standard (Part 1) is a part of a series of Indian Standards on Cabled Distribution Systems for Television and Sound Signals. The other parts of the series which are under various stages of preparation are given below:

- Part 2 Electromagnetic compatibility for components and systems
- Part 3 Active co-axial wide band distribution components
- Part 4 Passive co-axial wideband distribution components
- Part 5 Headend
- Part 6 System performance requirements

This standard is intended to provide specifically for the safety of the system, personnel working on it, subscribers and subscriber's equipment. It deals only with safety aspects and is not intended to define a standard for the protection of equipment used in the system.

While preparing this standard, assistance has been derived from IEC document 12G (Sectt.) 137, 'Cabled distribution systems for television and sound signals: Part 1 Safety requirement', issued by the International Electrotechnical Commission (IEC).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS — SPECIFICATION

PART 1 SAFETY REQUIREMENTS

1 SCOPE

1.1 This Indian Standard (Part 1) specifies with the safety requirements applicable to fixed sited systems and components primarily intended for the reception, processing and distribution of sound signals, television signals and their associated data signals using all applicable transmission media.

1.2 It covers all types of systems such as CATV-systems, MATV-systems, Individual receiving systems and all types of equipment items installed in such system from the receiving antennas to the system outlets (subscriber equipment input).

1.3 As far as applicable it is also valid for mobile and temporarily installed systems, for example, caravans.

1.4 This standard does not cover subscriber equipment.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMS AND DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 Community Antenna Television CATV System

A system designed to provide sound and television signals to communities.

3.2 Master Antenna Television MATV System

A system designed to provide sound and television signals to households in one or more buildings.

3.3 Individual Receiving System

A system designed to provide sound and television signals to an individual household.

3.4 Headend

Equipment which is connected between receiving antennas or other signal sources and the remainder of the cabled distribution system, to process the signals to be distributed.

3.5 Receiving Antenna

A device with the proper electrical characteristics that intercepts desired signals in the atmosphere and transfers these to the remainder of the cabled distribution system.

3.6 Cabled Distribution System (for Television and Sound Signals)

The general overall term used to define CATV-systems, MATV-systems and individual receiving systems.

3.7 Feeder

A transmission path forming part of a cabled distribution system. Such a path may consist of a metallic cable, optical fibre, waveguide, or any combination of them. By extension the term is also applied to paths containing one or more radio links.

3.8 Spur Feeder

A feeder to which subscriber's taps or looped system outlets are connected.

3.9 Amplifier

A device to compensate for attenuation.

3.10 Splitter

A device in which the signal power at the input port is divided equally or unequally between two or more output ports.

3.11 Subscriber's Tap

A device for connecting a subscriber's feeder to a spur feeder.

3.12 System Outlet

A device for interconnecting a subscriber's feeder to a spur feeder.

3.13 Receiver Lead

A lead which connects the system outlet to the subscriber's equipment.

3.14 Subscriber's Feeder

A feeder connecting a subscriber's tap to a system outlet or, where the latter is not used, directly to the subscribers' equipment.

3.15 Subscriber's Equipment

Equipment at the subscriber's premises such as receivers, tuners, decoders, video recorders.

3.16 Transfer Point

An interface between the cabled distribution network and the building's internal network, each of which may be separately owned. The transfer point may contain a voltage dependent device and/or a galvanic isolator.

3.17 Galvanic Isolator

A device providing electrical isolation below a certain frequency range.

3.18 Surge Suppressor

A device designed to limit the surge voltage between two parts within the space to be protected, such as a spark gap, surge diverter or semiconductor device.

3.19 Attenuation

The attenuation of any system or equipment is the decibel ratio of the input power to the output power.

3.20 Earthing Terminal

The connection point by means of which the earthing or grounding of a conducting part of an equipment is accomplished.

3.21 Earth Electrode

A conductive part or a group of conductive parts in intimate contact with and providing an electrical connection with earth.

3.22 Protective Conductor (Symbol PE)

A conductor required by some measures for protection against electric shock for electrically connecting any of the following parts:

- — exposed conductive parts
- — extraneous conductive parts
- — main earthing terminal
- — earth electrode
- — earthed point of the source or artificial neutral.

3.23 Earthing Conductor

A protective conductor connecting the main earthing terminal to the earth electrode.

3.24 Neutral Conductor (Symbol N)

A conductor connected to the neutral point of a system and capable of contributing to the transmission of electrical energy.

3.25 Equipotential Bonding Conductor

A protective conductor for ensuring equipotential bonding.

3.26 Equipotential Bonding

Electrical connection putting various exposed-conductive-parts and extraneous-conductive-parts at a substantially equal potential.

3.27 Equipotential Bonding Bar

A bar to which for example, extraneous-conductive-parts, metal sheath of electrical power and telecommunication cables and other cables can be bonded.

3.28 Lightning Protection System (LPS)

The complete system used to protect a space against the effects of lightning. It consists of both external and internal lightning protection systems.

3.29 'Natural' Component of an LPS

A component which performs a lightning protection function but is not installed specifically for that purpose.

3.30 Earth-Termination System

That part of an external earthing system which is intended to conduct and disperse current in the earth.

3.31 Metal Installation

Extended metal items which may form a path for lightning current such as pipe-work, staircases, elevator guide rails, ventilation, heating and conditioning ducts and interconnected reinforcing steel.

3.32 Safety Distance

The minimum distance between two conductive parts within the space to be protected between which no dangerous sparking can occur.

3.33 Main Earthing Terminal Equipotential Bonding Bar

A terminal or bar provided for the connection of protective conductors, including equipotential bonding conductors and conductors for functional earthing if any, to the means of earthing.

4 GENERAL REQUIREMENTS

The cabled distribution system shall be so designed, constructed and installed as to present no danger, either in normal use or under any single fault condition, to subscribers, personnel working on or externally inspecting the system, or to any other person, providing particularly:

a) personal protection against electric shock,
b) personal protection against physical injury, and
c) protection against fire.

NOTE — For service and operation conditions the above does not apply to trained, authorised personnel working on the equipment, who may be exposed to live parts of the equipment by the removal of protective covers.

4.1 Mechanical

All parts of the system shall be so constructed that there is no danger of physical injury from contact with sharp edges or corners.

4.2 Access

A standard test finger shall not make contact with any live parts of the system which are accessible to the general public without first removing a protective cover by the use of a tool. The standard test finger is defined in IS 616 : 1986.

5 WEATHER PROTECTION

All equipment and cables exposed to weather, especially corrosive atmosphere, adverse temperature or other adverse conditions shall be so constructed or protected as may be necessary to prevent danger arising from such exposure.

If, in conditions of sunshine falling on parabolic antennas, solar radiation is focussed near the feed end of the network of the parabolic reflector such that burning may occur, the equipment must be fitted with a warning notice in a clearly visible position.

6 EQUIPOTENTIAL BONDING AND EARTHING

6.1 General Requirements

The cabled distribution system shall be designed and constructed with the requirements of IS 732 : 1989 so that no hazardous voltages can be present on the outer conductors of any cable or accessible metalwork of any equipment, including passive items. The requirements for the subscriber's outlet are specified in **10**, the requirements for bonding and for lightning protection of antenna systems in **11**.

These bonding requirements are intended to protect only the cabled system and shall not be considered to provide protection against electric shock from electrical installations.

Where cabled distribution systems are installed outdoor on the same poles as those of the electric supply, a common earthing may be used.

6.2 Equipotential Bonding Mechanisms

6.2.1 Metallic enclosures for mains supplied equipment, except on subscriber premises, shall be bonded. An example from bonding units within the enclosure is shown in Fig. 1.

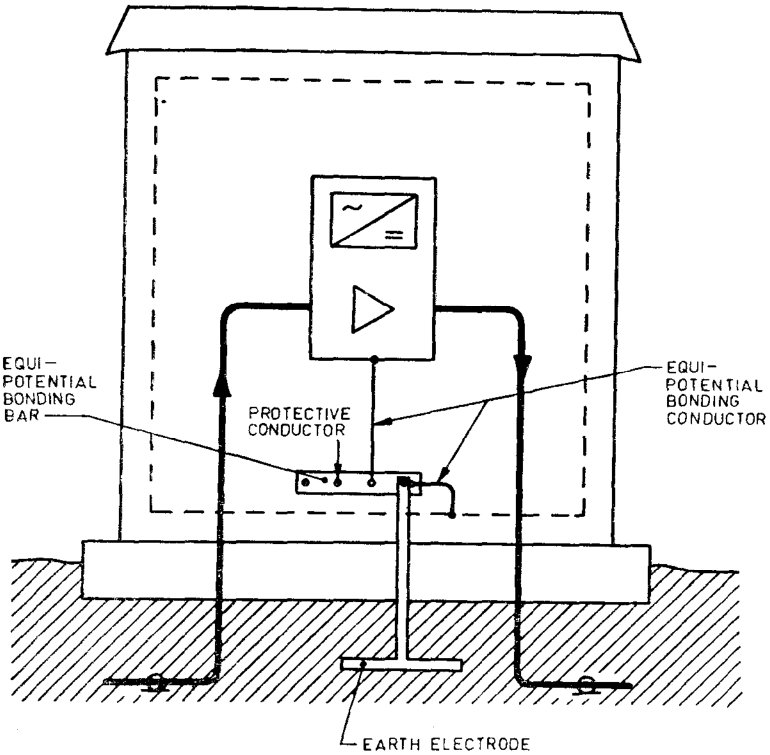


FIG. 1 EXAMPLE OF EQUIPOTENTIAL BONDING AND EARTHING A METAL ENCLOSURE

6.2.2 Where direct connection to an earthing system is not suitable because balancing currents are expected to flow in the outer conductor, for example, in extensive horizontally cabled distribution systems, special protection shall be provided.

This protection shall be achieved, as shown in Fig. 2 either by:

a) Mounting the equipment within a non-metallic enclosure; or

b) Fitting a voltage dependent device to the system between the metallic enclosure and the local earth such that hazardous voltages shall be removed from the outer conductor and accessible metalwork of the system.

A suitable warning notice shall be provided inside the enclosure.

If the balancing currents in the conductors exceed the maximum current allowed by the manufacturer of the cable and/or the manufacturer of the cable connectors used in the system, galvanic isolation shall be introduced as given in **6.2.3**.

6.2.3 Where galvanic isolation is provided between sections of the network, to eliminate balancing currents due to local potential differences. the outer conductors of each isolated section shall be connected to an earthing system.

NOTE — The galvanic isolator may be liable to radiate or pick-up high frequency energy, and can be damaged by overvoltages.

6.2.4 The outer conductors of coaxial cables entering and/or leaving a building, shall be bonded directly to a common equipotential bonding bar. The subscriber feeder cables need not to be bonded if a galvanic isolator or fully isolated outlets (*see* **10**) or transfer points are used. Examples are shown in Fig. 3, 4 and 5.

6.2.5 Where bonding is not possible and to avoid balancing currents between the cabled distribution system and the building installation a galvanic isolator shall be used. An example is shown in Fig. 5.

NOTE — The galvanic isolator may be liable to radiate or pick up high frequency energy and can be damaged by overvoltages.

6.2.6 Provision shall be made to maintain continuity of the outer conductor system while units are changed or removed. An example is shown in Fig. 6.

6.2.7 The equipotential bonding conductor connected to the main earthing terminal shall

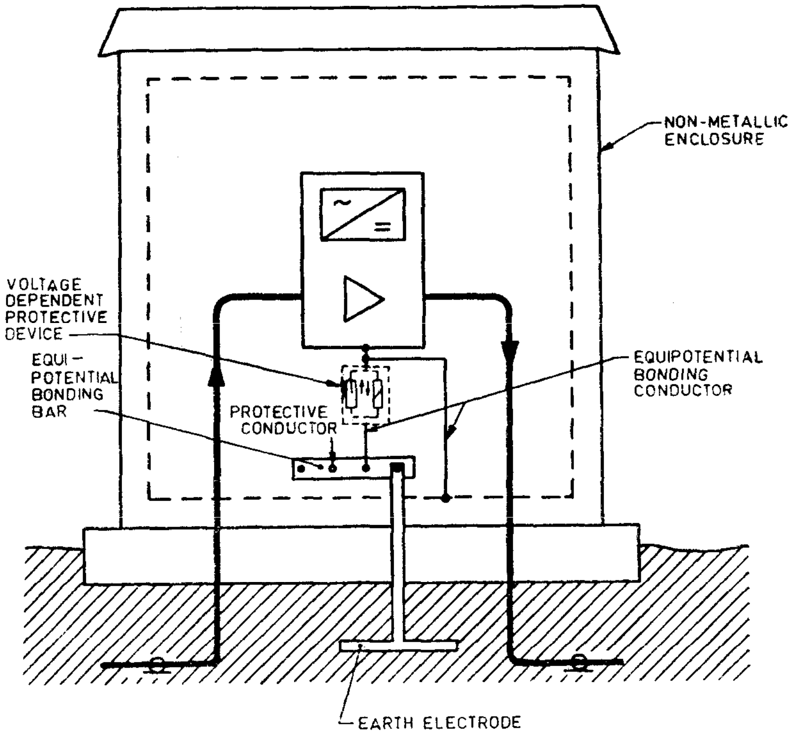

NON-METALLIC ENCLOSURE
VOLTAGE DEPENDENT PROTECTIVE DEVICE
EQUI-POTENTIAL BONDING BAR
PROTECTIVE CONDUCTOR
EQUIPOTENTIAL BONDING CONDUCTOR
EARTH ELECTRODE

FIG. 2 EXAMPLE OF EQUIPOTENTIAL BONDING AND INDIRECTLY EARTHING A METAL ENCLOSURE VIA A VOLTAGE DEPENDENT PROTECTIVE DEVICE (IN CASE OF BALANCING CURRENTS)

be mechanically stable and shall be of copper with a minimum cross-sectional area of $4\ \text{mm}^2$.

6.2.8 Every connection of a protective conductor or an earthing conductor to an earthing terminal shall be readily accessible and soundly made by the use of crimps, clamps, weld or hard soldered joints.

6.2.9 All metallic enclosures, housings, mounting bays, racks and mains supplied equipment of metallic construction, shall be provided with an external earthing terminal as shown in Fig. 7 and 8 according to IS 616 : 1986.

NOTE — Line powered amplifiers, taps, splitters and transfer points may also be fitted with earthing terminals.

7 MAINS SUPPLIED EQUIPMENT

7.1 Equipment

7.1.1 The devices used in a cabled distribution system shall meet the requirement of Class-II equipment as per IS 616 : 1986.

7.1.2 Devices installed outdoors and operated from the mains supply shall be so constructed that the harmful effects of moisture, water, dust, etc, are prevented. Alternatively they shall be installed in an appropriate drip-proof, splash-proof or water-tight enclosure so as to provide the appropriate degree of protection.

7.2 Connection to the Mains Supply

7.2.1 The connection to the mains supply shall conform to the requirements of IS 616 : 1986.

7.2.2 The connection of a Class-II equipment to the mains supply shall be only bipolar. The protective conductor, if any, of Class-II equipment shall not be connected to the mains protective conductor.

7.2.3 If the Class-II equipment is provided with a flexible power cable than either it shall be fitted with a bipolar plug, that is, without a contact to the protective conductor or, where the power system requires the presence on the plug of a third (protective conductor) pin to gain access to the supply, no connection shall be made to that third pin. An example is shown in Fig. 8.

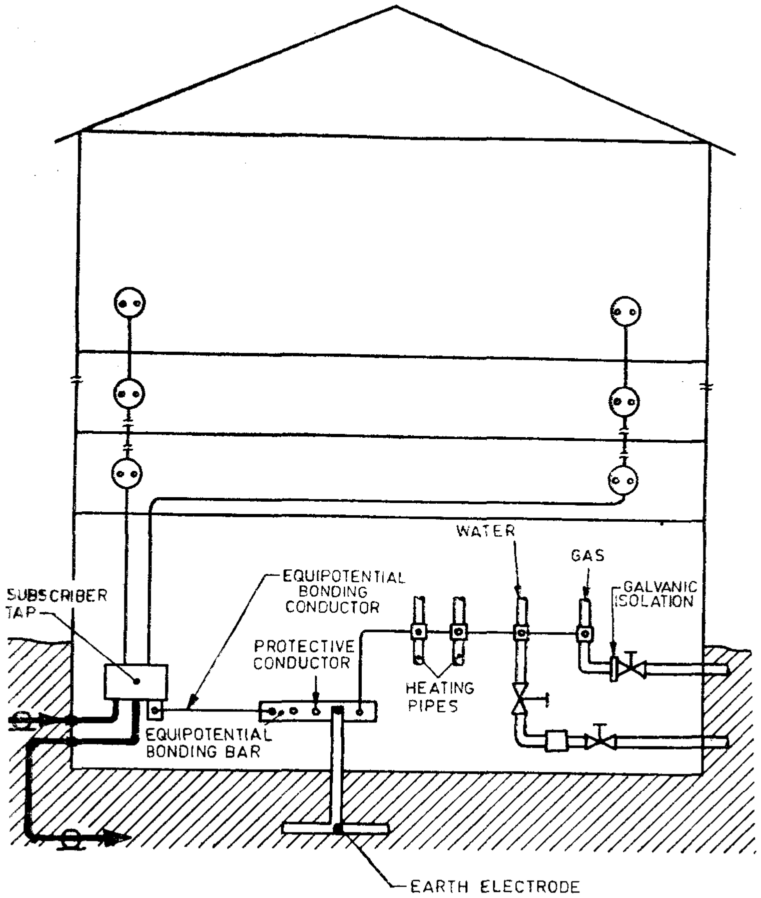


Fig. 3 Example of Equipotential Bonding and Earthing a Building Installation (Underground Connection)

NOTE — If different potentials build up between the protective conductor and the equipotential bonding terminal, for example in older buildings, no balancing currents shall flow and produce excessive heat.

8 NETWORK POWERING OF THE CABLED DISTRIBUTION SYSTEM

8.1 Line Powering

The line powering voltage between inner and outer conductors of the feeder cable shall not exceed 65 V rms. The following conditions shall be met:

- Line powering shall be confined to feeders only and shall not extend to the subscriber's cable.
- The line powering voltage shall be completely inaccessible to the public.
- The line powering voltage shall be accessible to authorized personnel only after removal of equipment covers by means of a tool.

A true rms reading instrument shall be used to determine this voltage.

8.2 Power from Subscriber

Where back powering to a network or to outdoor equipment such as preamplifiers, low noise converters, polarizers in antenna installations, are incorporated, the system shall comply with following.

8.2.1 The maximum voltage applied between the inner and outer conductor of the subscriber's feeder shall not exceed 24 V ac rms or 34 V dc.

A true rms reading instrument shall be used to determine the ac voltage.

8.2.2 The equipment shall be so designed and constructed that no dangerous currents can flow under normal operating or single fault conditions.

8.2.3 The equipment providing the power shall, if that power is derived from a mains supply,

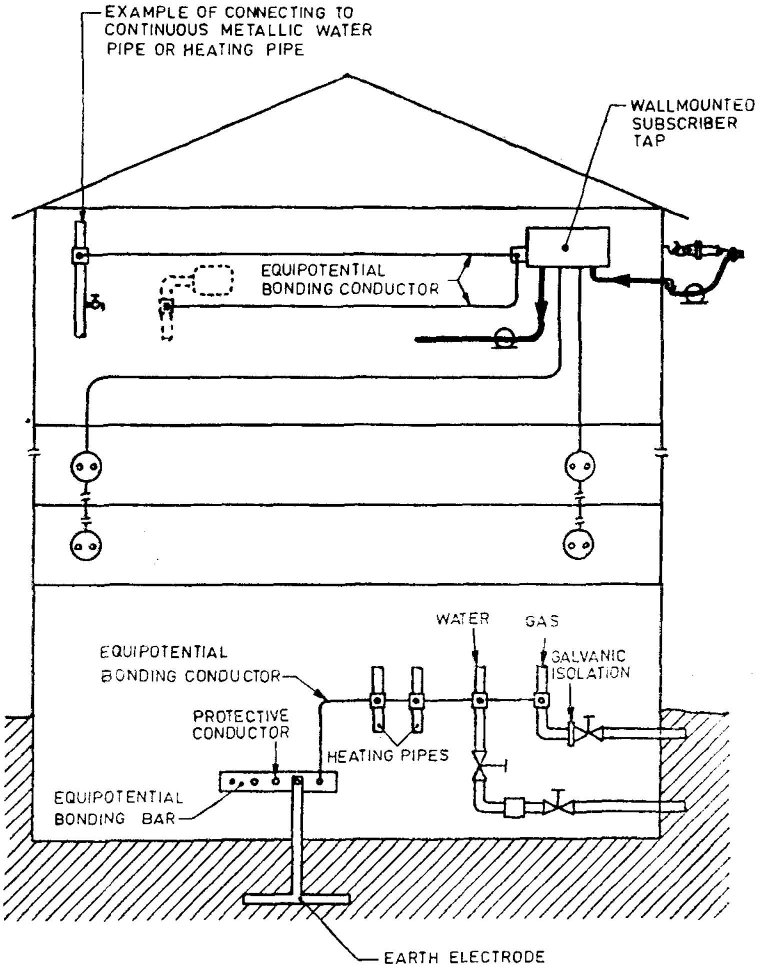

EXAMPLE OF CONNECTING TO CONTINUOUS METALLIC WATER PIPE OR HEATING PIPE
WALLMOUNTED SUBSCRIBER TAP
EQUIPOTENTIAL BONDING CONDUCTOR
WATER
GAS
GALVANIC ISOLATION
EQUIPOTENTIAL BONDING CONDUCTOR
PROTECTIVE CONDUCTOR
HEATING PIPES
EQUIPOTENTIAL BONDING BAR
EARTH ELECTRODE

FIG. 4 EXAMPLE OF EQUIPOTENTIAL BONDING AND EARTHING A BUILDING INSTALLATION (ABOVE GROUND CONNECTION)

comply with clauses as specified in 7. If fully isolated system outlets or transfer points (*see* **10**) are used, only Class-II equipment shall be used to provide back-power.

8.2.4 Repointing motors and de-icing devices are normally separately fed. Specific requirements and recommendations are not specified here.

9 PROTECTION AGAINST CONTACT AND PROXIMITY TO ELECTRIC POWER DISTRIBUTION SYSTEMS

9.1 When parts of the outdoor antenna system are in proximity to electric power distribution system in open air with voltages up to 1 000 V the following requirements shall be met:

a) The horizontal distance between antenna support structures or masts and electric power distribution systems shall not be less than 1 m; and

b) The distance between parts of the antenna and electric power distribution systems shall not be less than 1 m. The swinging of the electric power cables shall not be taken into account.

9.2 The distance between parts of the cabled system and uninsulated parts, including all supporting structures, of an electric power distribution system carrying voltages between 50 V and 1 000 V shall be at least 10 mm if indoors and 20 mm when installed outside.

This distance may be less only if there is sufficient insulated material, for example, cable with insulating jacket, between the conductors of the two systems, thus guaranteeing that these conductors do not touch each other.

For systems carrying voltages of more than 1 kV, the distances shall be larger unless sufficient insulation is provided to prevent arcing. Requirements and recommendations are under consideration.

10 SYSTEM OUTLETS AND TRANSFER POINTS

The subscriber's equipment may be connected to the cabled distribution systems directly or by means of system outlets and/or transfer points. These devices provide the necessary safety protection between the subscriber's equipment and the cabled distribution system.

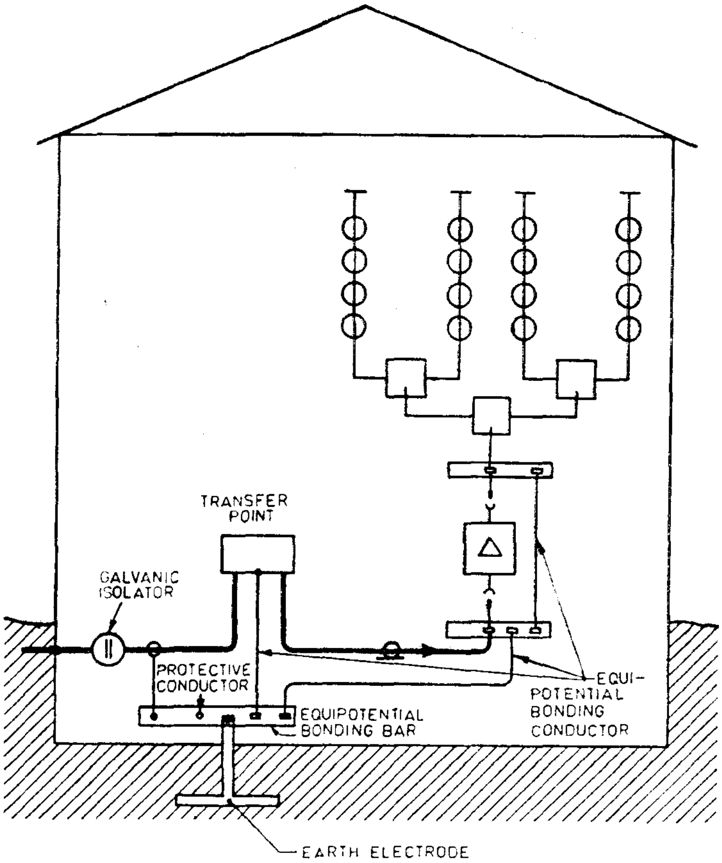


FIG. 5 EXAMPLE OF EQUIPOTENTIAL BONDING A GALVANIC ISOLATED CABLE ENTERING A BUILDING (UNDERGROUND CONNECTION)

NOTE — Except in the case of fully isolated outlets (**10.1.1**), the achieved protection depends on equipotential bonding of the outer conductor of the subscriber's feeder. It must be pointed out that under certain combinations of fault conditions and the use of Class-I equipment, the outer conductor of the subscriber's feeder can act as a protective conductor of the electricity supply with the result that large fault currents may flow for a considerable period of time depending on the protection provided in the electrical distribution system.

Where subscriber outlets or transfer points are not used, protection shall be provided at the output of the subscriber's tap.

Where safety protection is provided by means of isolating capacitors or transformers the complete device shall comply with the relevant requirements of IS 616 : 1986.

10.1 System Outlet

There are four types of system outlets in common use providing varying degrees of protection against electric shock, but also more or less liable to radiate to pick-up high frequency energy.

10.1.1 *Fully Isolated System Outlet*

This type of outlet incorporates isolating component in series with both the inner and the outer conductors of the coaxial connectors. The isolating components may be either high voltage capacitors or double wound transformers.

NOTE — System outlets of this type are liable to radiate or pick up high frequency energy.

10.1.2 *Semi-isolated System Outlet*

This type of outlet incorporates an isolating component in series with the inner conductor only of the coaxial connector. If this outlet is used, the protection shall be provided by equipotential bonding of the outer conductor of the subscriber's feeder. In this case the dc resistance between the outer conductor of the connector and the nearest network equipotential bonding point shall be less than 5 ohm. The isolating component may be either a high voltage capacitor or a double wound transformer.

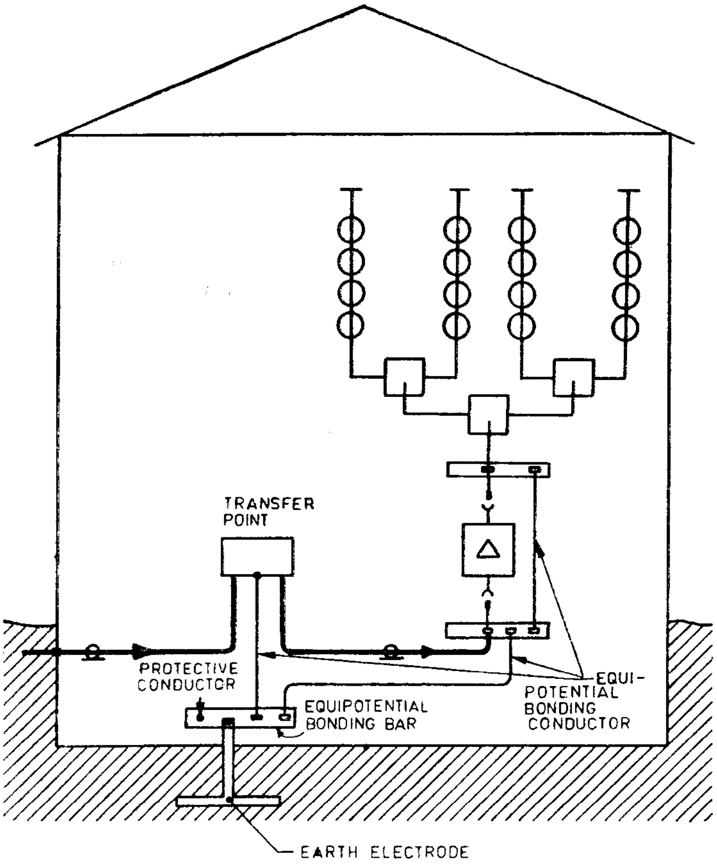


FIG. 6 EXAMPLE OF MAINTAINING EQUIPOTENTIAL BONDING WHILE A UNIT IS REMOVED

10.1.3 *Non-isolated System Outlet with Protective Element*

This type of outlet does not incorporate any series isolation. Protection shall be provided by equipotential bonding as in **10.1.2**. A protective element to improve safety (for example, an RF coil) shall be connected between the inner and outer conductors of the coaxial connectors. The dc resistance of this protective element shall be less than 1 ohm.

The dc resistance between the outer conductor of the connector/s and the nearest network equipotential point shall be less than 5 ohm.

10.1.4 *Non-isolated System Outlet Without Protective Element*

This type of outlet incorporates coaxial connector's only and does not contain any isolation component/s or protective element. This type of system outlet is used when back-powering from the subscriber's equipment is required. The protection shall be provided by equipotential bonding as in **10.1.2**.

10.2 Transfer Point

This device can also provide varying degrees of protection against electric shock, depending on elements incorporated. The same requirements as for the system outlet are applicable.

NOTE — Fully isolated transfer points are liable to radiate or pick up high frequency energy.

11 PROTECTION AGAINST ATMOSPHERIC OVERVOLTAGES AND ELIMINATION OF POTENTIAL DIFFERENCES

These protection requirements are intended to protect antenna systems, including satellite antennas against static atmospheric overvoltages and lightning discharges.

These protection requirements shall not be considered to provide protection for buildings and any other structures.

The following cases are excluded:

- antenna systems external to the building which are located more than 2 m below the apex of the roof and less than 1·5 m from the building.
- antenna systems enclosed within the building structure.

Antennas shall not be installed on buildings having roofs covered with highly flammable materials (for example, thatch, reedlike material and so on).

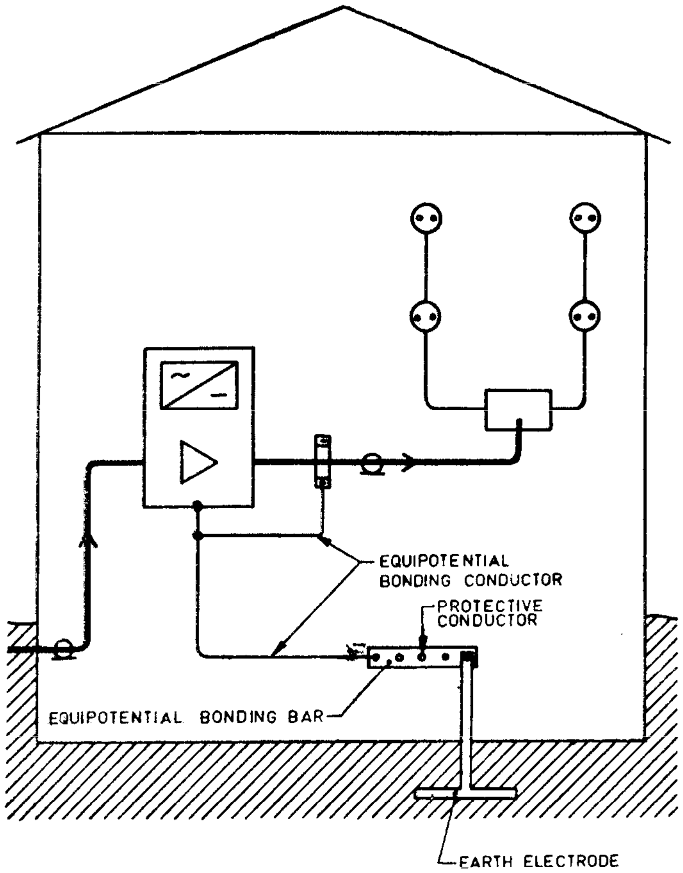


FIG. 7 EXAMPLE OF EXTERNAL EQUIPOTENTIAL BONDING

Antenna cables and earthing conductors shall not be laid through areas used for the storage of easily ignitable materials such as hay, straw and such like substances or through areas in which explosive gases can develop or collect.

AM sound broadcasting receiving antennas shall incorporate a protective device connected to a bonding conductor.

11.1 Protection of the Antenna System

11.1.1 *Building Equipped with a Lightning Protection System (LPS)*

If the building is equipped with an LPS conforming to IS 2309 : 1989, the antenna mast, being a metal installation, shall be connected to the building's LPS, via the shortest possible path and using an earthing conductor as specified under **11.2**.

The outer conductors of all coaxial cables coming from the antennas shall be connected to the mast via an equipotential bonding copper conductor having a minimum cross-sectional area of 4 mm^2 (*see* Fig. 8).

11.1.2 *Building not Equipped with an LPS*

If the building is not equipped with an LPS conforming to IS 2309 : 1989, mast and coaxial cables outer conductors shall be earthed as specified under **11.2**.

For individual receiving systems, or MATV systems confined to one building where, due to low lightning probability, local regulations allow, protection against lightning is not necessary but only recommended.

11.2 Earthing and Bonding of the Antenna System

11.2.1 *Earthing and Bonding Mechanisms*

The mast and the outer conductors of the coaxial cables shall be connected to earth via earthing conductors using the shortest possible path. The formation of loops shall be avoided. The earthing conductors shall be installed straight and vertical such that they can provide the shortest, most direct path to the earth-termination system.

11.2.2 *Earth Termination-System*

The earth termination system shall be provided by one of the following methods as shown in Fig. 9:

- connection to the building's lightning protection system;
- connection to the building's earthing system;
- connection to a minimum of two horizontal electrodes of at least 5 m length

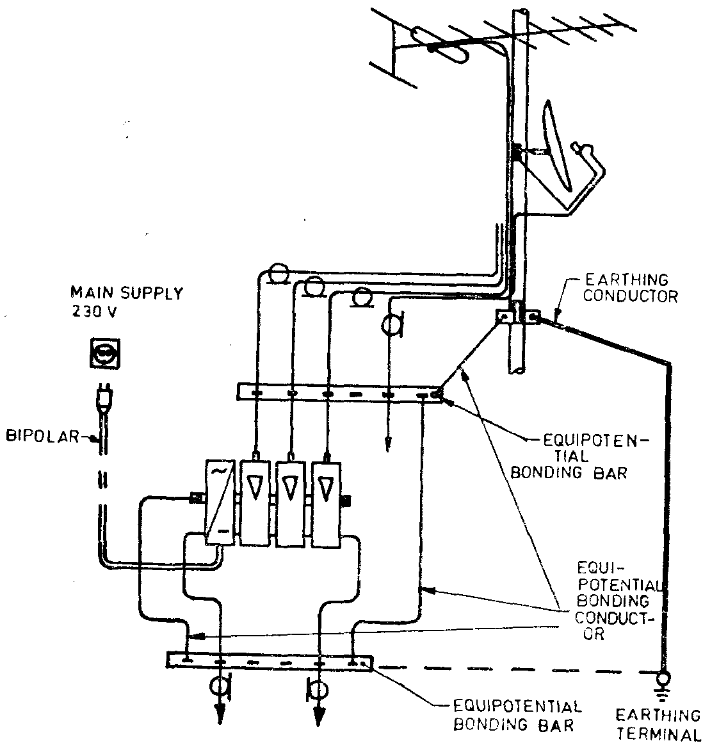

MAIN SUPPLY
230 V
BIPOLAR
EARTHING CONDUCTOR
EQUIPOTENTIAL BONDING BAR
EQUIPOTENTIAL BONDING CONDUCTOR
EQUIPOTENTIAL BONDING BAR
EARTHING TERMINAL

FIG. 8 EXAMPLE OF EQUIPOTENTIAL BONDING ANTENNAS AND HEADENDS

or a vertical or inclined electrode of at least 2·5 m buried at a depth of at least 0·5 m, not closer than 1 m to the walls. The minimum cross-sectional area of each electrode is 50 mm² copper or 80 mm² iron.

'Natural' components such as interconnected concrete reinforcing steel or other suitable underground metal structure, incorporated in the building foundation whose dimensions comply with the above mentioned limits, may also be employed.

11.2.3 *Earthing Conductors*

A suitable earthing conductor is a single solid wire having a minimum cross-sectional area of not less than 16 mm² copper insulated or bare, or 25 mm² insulated aluminium or 50 mm² iron.

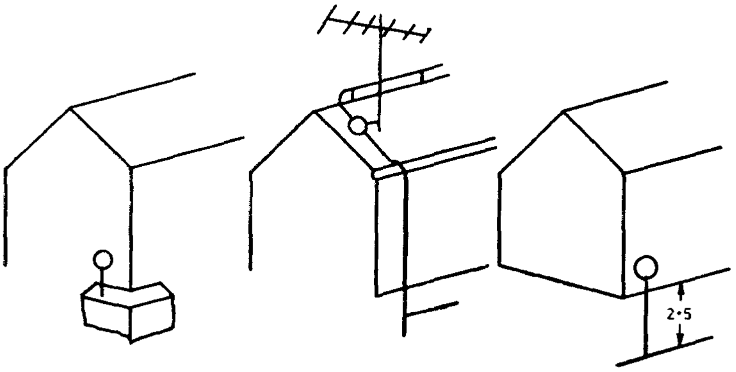
'Natural' components can be employed as given below (*see* Fig. 9).

a) Metal installations such as continuous metallic water supply pipes or continuous metallic heating pipes provided that:
   - — the electrical continuity between various parts is made durable; and
   - — their dimensions are at least equal to those specified for standard earthing conductors

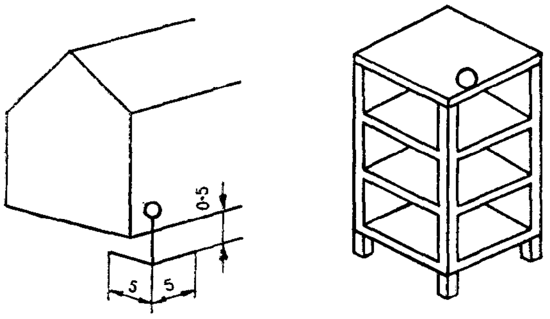
b) The metal framework of the structure

c) The interconnected steel of the structure

d) Facade elements, profiled rails and sub-constructions of metal facades provided that:
   - — their dimensions comply with the requirements for down conductors and their thickness is not less than 0·5 mm; and



9A Conductor in Building Foundations 9B Building Lightning Protection System 9C Steel Rod



O EARTHING TERMINAL

9D Steel Strip 9E Structural Steel Work

Fig. 9 Examples of Earthing Mechanisms

— their electrical continuity in a vertical direction is assured (joints shall be made secure by such means as brazing, welding, crimping, screwing or bolting) the distance between the metal parts does not exceed 1 mm and the overlap between two elements is at least 100 cm^2.

The following are specifically excluded:

a) protective earth and/or neutral conductors of the electricity supply,

b) the outer conductor of any coaxial cable.

11.3 Overvoltage Protection

Induction can introduce high voltage at transfer points, system outlets, at the head-end of the cabled distribution system, or at the input of subscriber's equipment. Protection may be achieved for example by equipotential bonding via surge suppressors.

12 MECHANICAL STABILITY

12.1 General Requirements

This standard deals only with the mechanical stability of outdoor antenna systems including satellite antennas.

All parts of the antenna system shall be so designed that they will withstand the maximum wind forces defined below, without breakage and none of the components shall be torn away.

12.2 Bending Moment

For antenna systems with masts up to a maximum free length of 6 m, as shown in Fig. 10, the bending moment at the fixing point shall not exceed 1 650 Nm. The windload of the mast should be at least one sixth of the free length.

NOTE — Where the length is greater than 6 m or where it is anticipated that this bending moment will be exceeded, or if other fixing methods are used, the services of a qualified person who can guarantee the safety of the structure and/or building, shall be employed.

12.3 Wind Pressure Values

For the purpose of establishing mast loadings, the following values may be used:

If antenna systems are established within 20 m of ground level, the value of p (wind pressure)

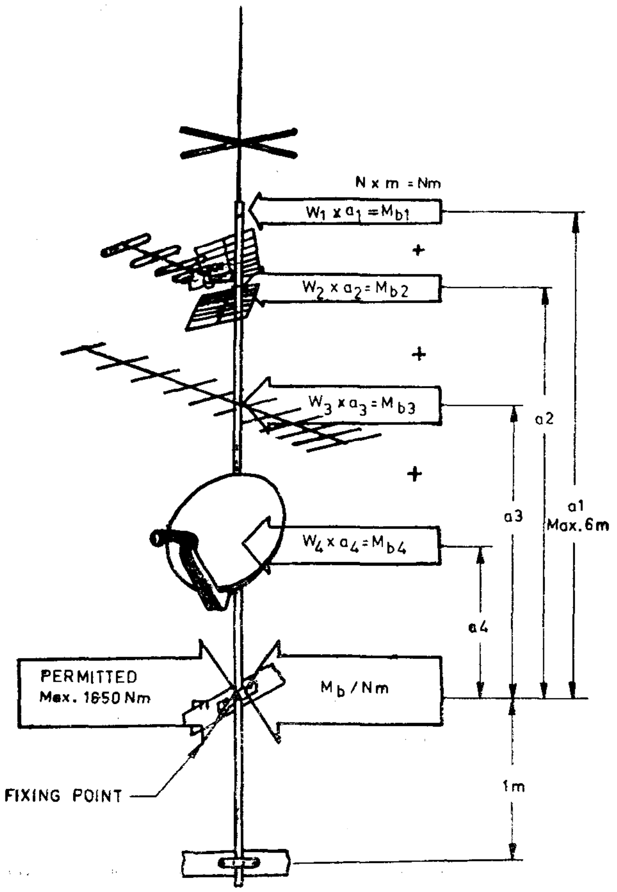


FIG. 10 BENDING MOMENT OF AN ANTENNA MAST

shall be assumed to be 800 N/m^2 (wind speed 36 m/s).

If antenna systems are established higher than 20 m above ground level, the value p (wind pressure) shall be assumed to be 1 100 n/m^2 (wind speed 42 m/s).

The windload on the antenna shall be calculated as follows:

$$W = c \cdot p \cdot A$$

where

W is the wind load in Newton,

c is the load coefficient,

p is the wind pressure in pascals (N/m), and

A is the component area.

The coefficient c to be used is 1·2.

Loading due to snow and ice is not considered.

NOTE — Adverse environmental conditions may require that a higher or lower wind pressure value is assumed, for example:

- for a wind speed of 45 m/s (160 km/h) the wind pressure shall be 1 250 N/m^2.
- for a wind speed of 56 m/s (200 km/h) the wind pressure shall be 1 900 N/m^2.

The bending moment at the fixing point shall be calculated as follows:

$$M_b = W_1 \cdot a_1 + W_2 \cdot a_2 + \ldots\ldots$$

where

M_b is the bending moment in Nm;

W_1, W_2, ... is the windload in N; and

a_1, a_2, ... is the mast length from the antenna to the fixing point in m.

12.4 Mast Construction

Where the mast is constructed from steel, the steel shall have a guaranteed extension limit and the maximum loading shall not exceed 90 percent of the extension limit so that the mast on being overloaded does not break but only buckles.

The minimum wall thickness of the mast in the fastening area shall be 2 mm.

12.5 Data to be Published

The antenna manufacturer shall publish the following data for wind pressure of $p = 800$ N/m^2:

a) The wind load of the antennas,

b) The maximum bending moment of the masts at the fixing.

NOTE — To convert the wind pressure of $p = 800$ N/m^2 to $p = 1\,100$ N/m^2 the factor is 1·37 (1 100 : 800).

ANNEX A

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
616 : 1986	Safety requirements for mains operated electronic and related apparatus for household and similar general use (*second revision*) (reaffirmed 1991)
732 : 1989	Electric installations in buildings (*third revision*)
2309 : 1989	Code of practice for the protection of buildings and allied structures against lighting (*second revision*)

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This Indian Standard has been developed from Doc No. LTD 20 (1742).

Amendments Issued Since Publication

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